

# International **IR** Rectifier

Data Sheet No. PD60162-N

## IR2106(4) (S)

### HIGH AND LOW SIDE DRIVER

#### Features

- Floating channel designed for bootstrap operation
- Fully operational to +600V
- Tolerant to negative transient voltage
- $dV/dt$  immune
- Gate drive supply range from 10 to 20V (IR2106(4))
- Undervoltage lockout for both channels
- 3.3V, 5V and 15V input logic compatible
- Matched propagation delay for both channels
- Logic and power ground +/- 5V offset.
- Lower  $dV/dt$  gate driver for better noise immunity
- Outputs in phase with inputs (IR2106)

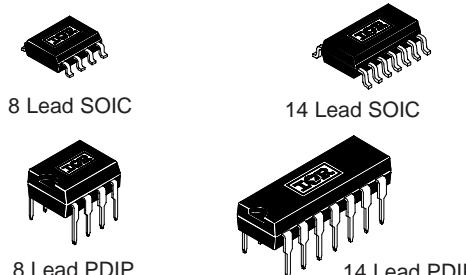
#### Description

The IR2106(4)(S) are high voltage, high speed power MOSFET and IGBT drivers with independent high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high side configuration which operates up to 600 volts.

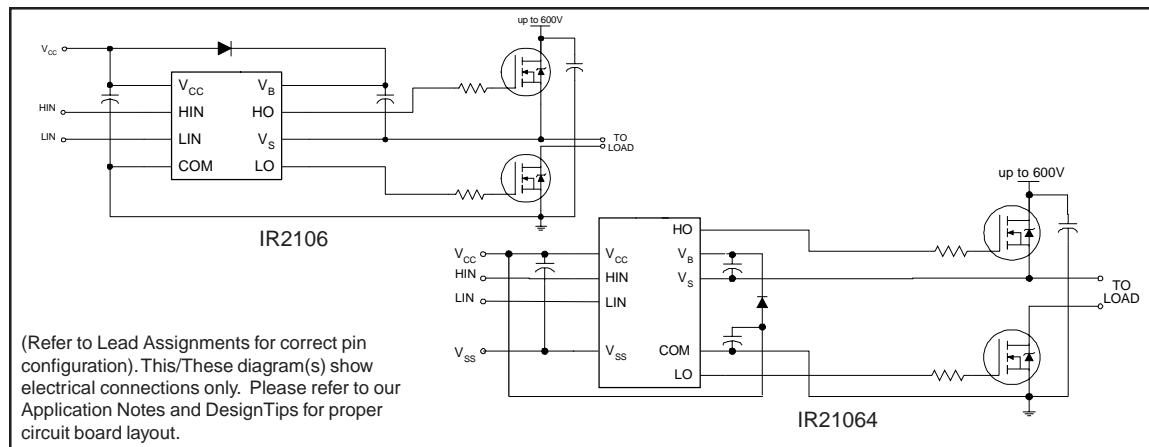
#### Product Summary

$V_{OFFSET}$	600V max.
$I_{O+/-}$	120 mA / 250 mA
$V_{OUT}$	10 - 20V (IR2106(4))
	7 - 20V (IR2186)
$t_{on/off}$ (typ.)	180 ns
Delay matching	50 ns

#### Packages



#### Typical Connection



## Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

Symbol	Definition	Min.	Max.	Units
$V_B$	High side floating absolute voltage	-0.3	625	V
$V_S$	High side floating supply offset voltage	$V_B - 25$	$V_B + 0.3$	
$V_{HO}$	High side floating output voltage	$V_S - 0.3$	$V_B + 0.3$	
$V_{CC}$	Low side and logic fixed supply voltage	-0.3	25	
$V_{LO}$	Low side output voltage	-0.3	$V_{CC} + 0.3$	
$V_{IN}$	Logic input voltage	$V_{SS} - 0.3$	$V_{CC} + 0.3$	
$V_{SS}$	Logic ground (IR21064 only)	$V_{CC} - 25$	$V_{CC} + 0.3$	
$dV_S/dt$	Allowable offset supply voltage transient	—	50	V/ns
$P_D$	Package power dissipation @ $T_A \leq +25^\circ\text{C}$	(8 lead PDIP)	—	1.0
		(8 lead SOIC)	—	0.625
		(14 lead PDIP)	—	1.6
		(14 lead SOIC)	—	1.0
$R_{thJA}$	Thermal resistance, junction to ambient	(8 lead PDIP)	—	125
		(8 lead SOIC)	—	200
		(14 lead PDIP)	—	75
		(14 lead SOIC)	—	120
$T_J$	Junction temperature	—	150	$^\circ\text{C}$
$T_S$	Storage temperature	-50	150	
$T_L$	Lead temperature (soldering, 10 seconds)	—	300	

## Recommended Operating Conditions

The Input/Output logic timing diagram is shown in figure 1. For proper operation the device should be used within the recommended conditions. The  $V_S$  and  $V_{SS}$  offset rating are tested with all supplies biased at 15V differential.

Symbol	Definition	Min.	Max.	Units
$V_B$	High side floating supply absolute voltage IR2106(4)	$V_S + 10$	$V_S + 20$	V
$V_S$	High side floating supply offset voltage	Note 1	600	
$V_{HO}$	High side floating output voltage	$V_S$	$V_B$	
$V_{CC}$	Low side and logic fixed supply voltage IR2106(4)	10	20	
$V_{LO}$	Low side output voltage	0	$V_{CC}$	
$V_{IN}$	Logic input voltage	$V_{SS}$	$V_{CC}$	
$V_{SS}$	Logic ground (IR21064 only)	-5	5	
$T_A$	Ambient temperature	-40	125	°C

Note 1: Logic operational for  $V_S$  of -5 to +600V. Logic state held for  $V_S$  of -5V to  $-V_B$ . (Please refer to the Design Tip DT97-3 for more details).

## Dynamic Electrical Characteristics

$V_{BIAS}$  ( $V_{CC}$ ,  $V_B$ ) = 15V,  $V_{SS}$  = COM,  $C_L$  = 1000 pF,  $T_A$  = 25°C.

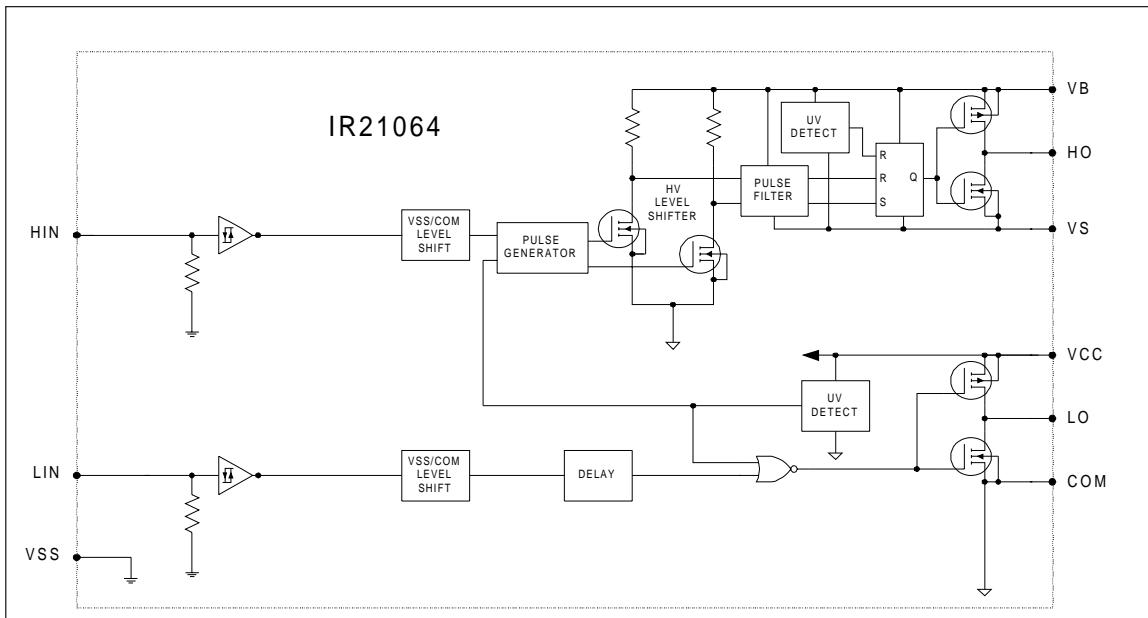
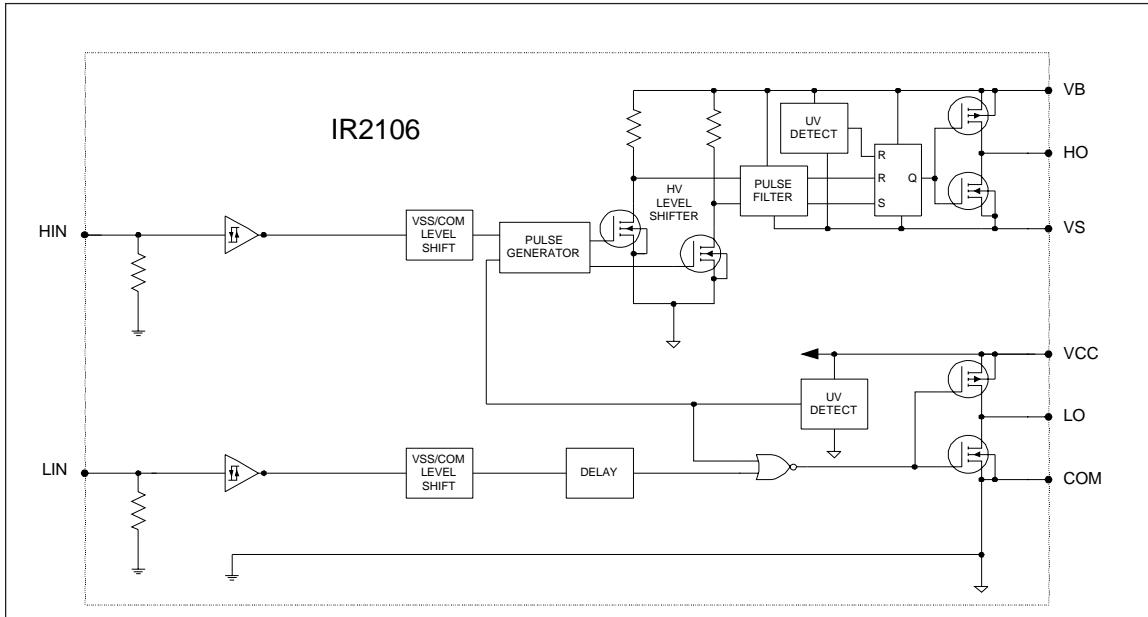
Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
$t_{on}$	Turn-on propagation delay	—	220	300	nsec	$V_S = 0V$
$t_{off}$	Turn-off propagation delay	—	200	280		$V_S = 0V$ or 600V
MT	Delay matching, HS & LS turn-on/off	—	0	30		
$t_r$	Turn-on rise time	—	150	220		$V_S = 0V$
$t_f$	Turn-off fall time	—	50	80		$V_S = 0V$

## Static Electrical Characteristics

$V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15V,  $V_{SS}$  = COM and  $T_A$  = 25°C unless otherwise specified. The  $V_{IL}$ ,  $V_{IH}$  and  $I_{IN}$  parameters are referenced to  $V_{SS}$ /COM and are applicable to the respective input leads. The  $V_O$ ,  $I_O$  and  $R_{on}$  parameters are referenced to COM and are applicable to the respective output leads: HO and LO.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
$V_{IH}$	Logic "1" input voltage (IR2106(4))	2.9	—	—	V	$V_{CC} = 10V$ to 20V
$V_{IL}$	Logic "0" input voltage (IR2106(4))	—	—	0.8		$V_{CC} = 10V$ to 20V
$V_{OH}$	High level output voltage, $V_{BIAS} - V_O$	—	0.8	1.4		$I_O = 20$ mA
$V_{OL}$	Low level output voltage, $V_O$	—	0.3	0.6		$I_O = 20$ mA
$I_{LK}$	Offset supply leakage current	—	—	50		$V_B = V_S = 600$ V
$I_{QBS}$	Quiescent $V_{BS}$ supply current	20	60	150		$V_{IN} = 0V$ or 5V
$I_{QCC}$	Quiescent $V_{CC}$ supply current	50	120	240		$V_{IN} = 0V$ or 5V
$I_{IN+}$	Logic "1" input bias current $V_{IN} = 5V$ (IR2106(4))	—	5	20		
$I_{IN-}$	Logic "0" input bias current $V_{IN} = 0V$ (IR2106(4))	—	1	2		
$V_{CCUV+}$ $V_{BSUV+}$	$V_{CC}$ and $V_{BS}$ supply undervoltage positive going threshold	8.0	8.9	9.8	V	
$V_{CCUV-}$ $V_{BSUV-}$	$V_{CC}$ and $V_{BS}$ supply undervoltage negative going threshold	7.4	8.2	9.0		
$V_{CCUVH}$ $V_{BSUVH}$	Hysteresis	0.3	0.7	—		
$I_{O+}$	Output high short circuit pulsed current	120	200	—	mA	$V_O = 0V$ , $PW \leq 10$ $\mu$ s
$I_{O-}$	Output low short circuit pulsed current	250	350	—		$V_O = 15V$ , $PW \leq 10$ $\mu$ s

## Functional Block Diagrams



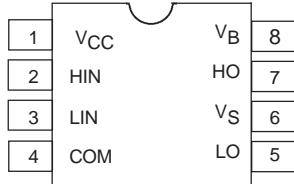
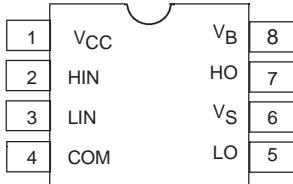
# IR2106(4) (S)

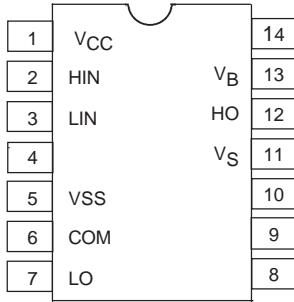
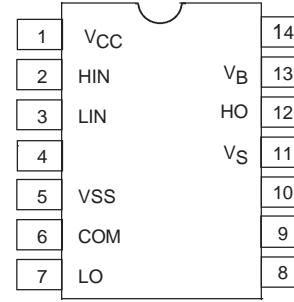
International  
**IR** Rectifier

## Lead Definitions

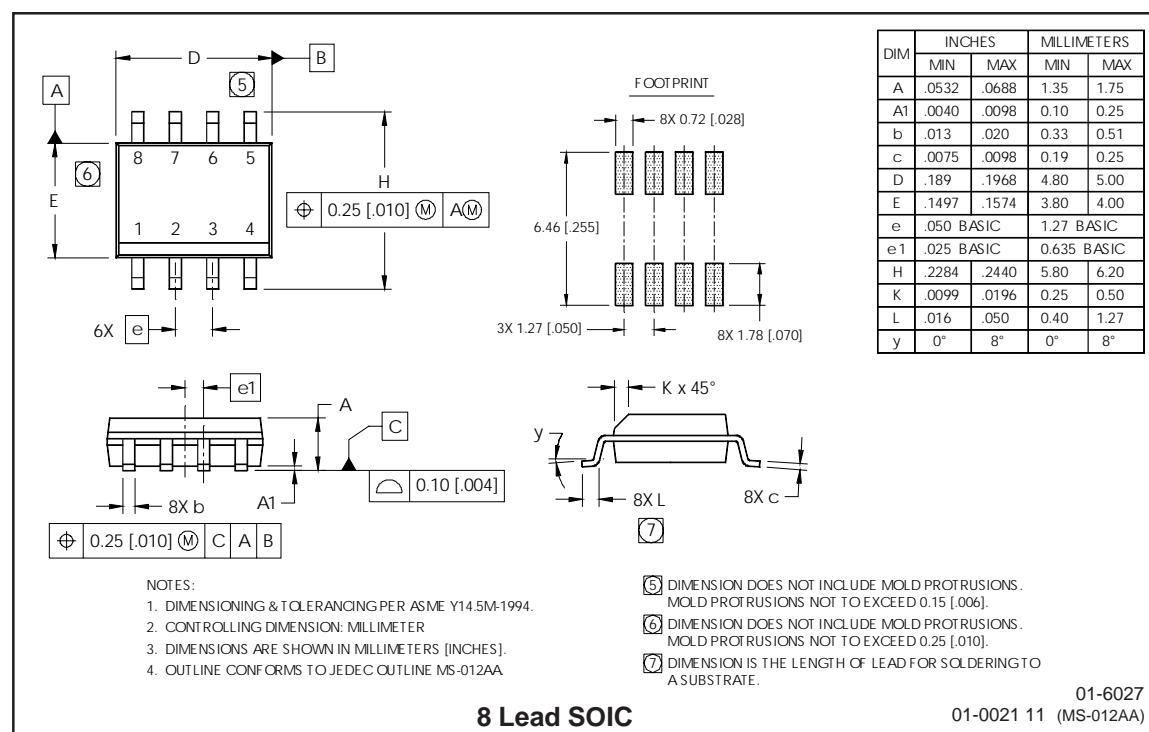
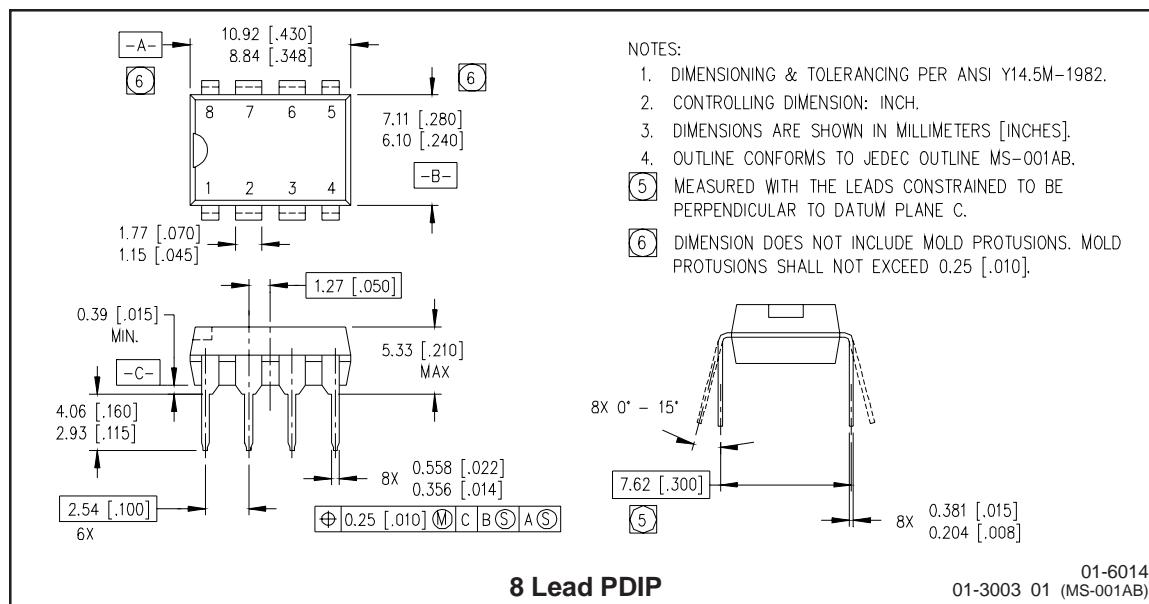
Symbol	Description
HIN	Logic input for high side gate driver output (HO), in phase
LIN	Logic input for low side gate driver output (LO), in phase
VSS	Logic Ground (IR21064 only)
V <sub>B</sub>	High side floating supply
HO	High side gate drive output
V <sub>S</sub>	High side floating supply return
V <sub>CC</sub>	Low side and logic fixed supply
LO	Low side gate drive output
COM	Low side return

## Lead Assignments

 <p>8 Lead PDIP</p>	 <p>8 Lead SOIC</p>
<b>IR2106</b>	<b>IR2106S</b>

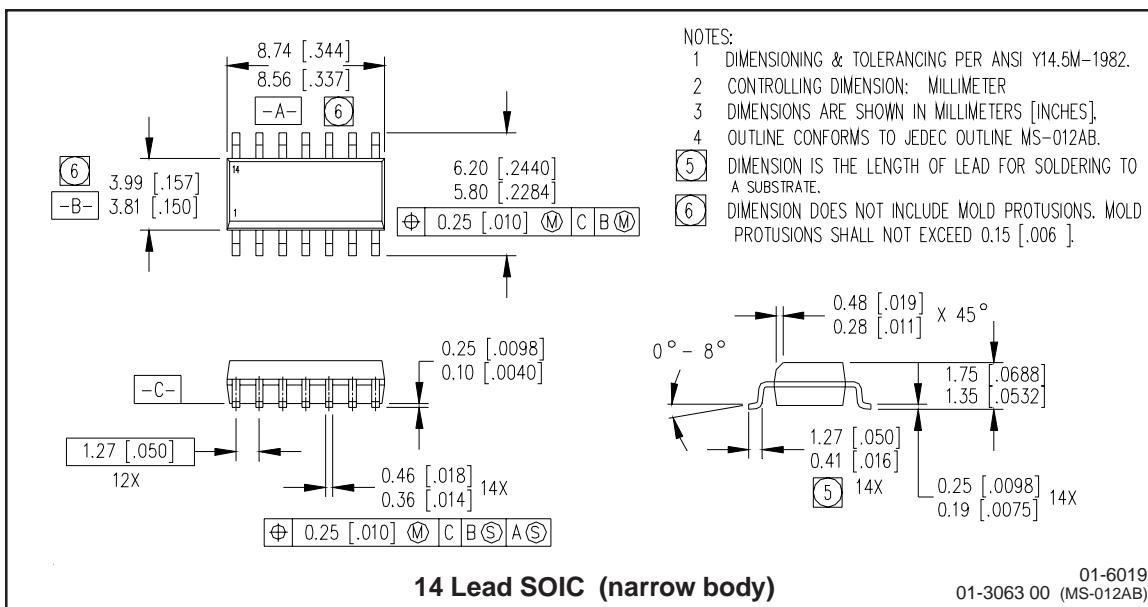
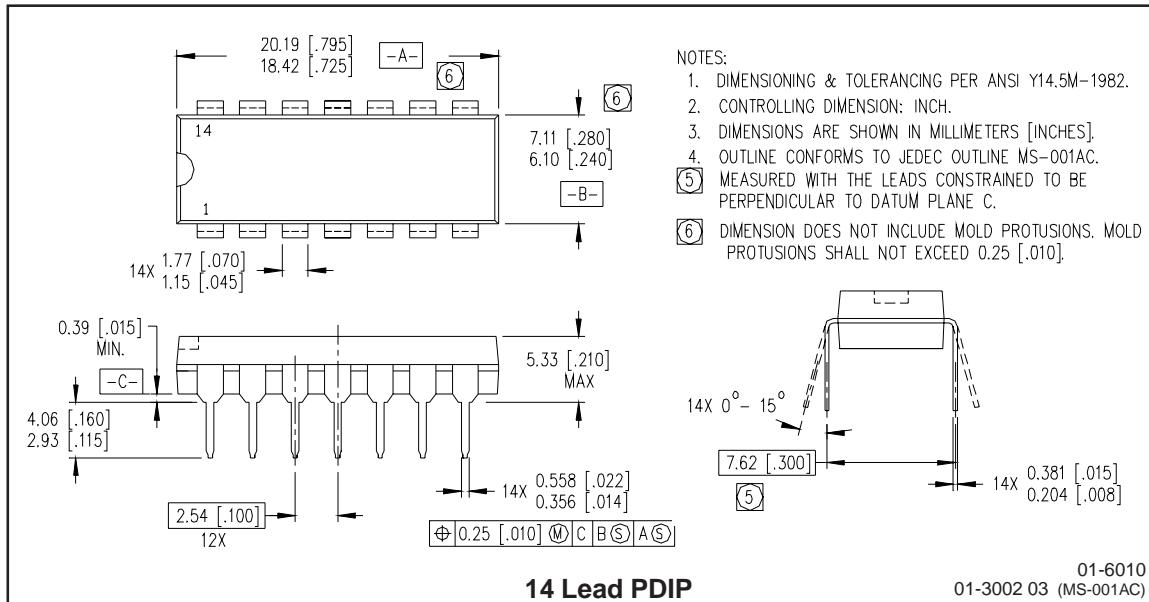
 <p>14 Lead PDIP</p>	 <p>14 Lead SOIC</p>
<b>IR21064</b>	<b>IR21064S</b>

**Case Outlines**



# IR2106(4) (S)

International  
**IR** Rectifier



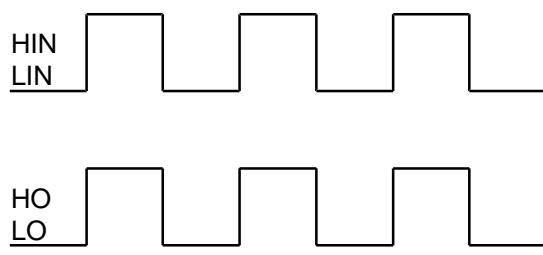


Figure 1. Input/Output Timing Diagram

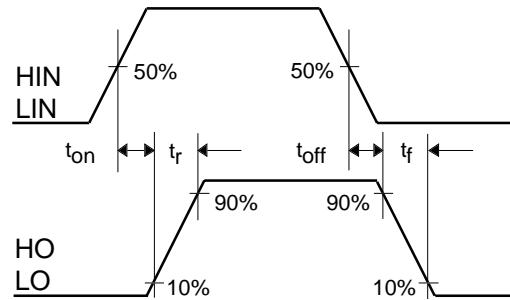


Figure 2. Switching Time Waveform Definitions

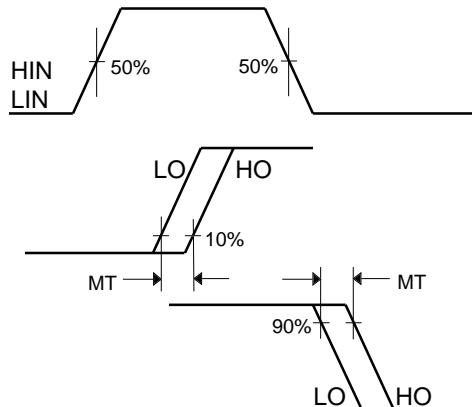


Figure 3. Delay Matching Waveform Definitions